

# Five new species of *Quercus* L. subgen. *Cyclobalanopsis* (Oersted) A. Camus from Malesia\*

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## Introduction

THE PRESENT paper is part of the work on the family *Fagaceae* from Malesia, now being prepared in Cambridge. Due to the limited time available, the present taxonomic account is restricted to the revision of the genus *Quercus* L. from Malesia.

During the preparation of this work, I have been able to investigate all specimens collected from Malesia, available in the Herbaria of Bogor, Cambridge, Edinburgh, Florence, Kew, Leiden, Paris, Sarawak and Singapore.

Two of the five new species described here, namely *Q. steenisii* and *Q. sumatrana*, were recognized as new by Dr. S. Hatusima, a Japanese botanist, who worked at the Herbarium Bogoriense, Bogor, Indonesia, during the period of 1943–1945. He, however, never published his work.

Specimens of *Q. gaharuensis* and *Q. percoriacea* were collected recently by Dr. J. A. R. Anderson from Sarawak.

Of the fifth species, *Q. pseudo-verticillata*, the first collection was made by Fuchs & Collenette in 1963 from Pinosuk Plateau, Mt. Kinabalu, North Borneo. During the second Royal Society expedition to Mt. Kinabalu (1964), Mr. E. J. H. Corner and Dr. Chew Wee Lek collected ample materials of this new species, and their specimens were chosen as type.

## Acknowledgement

I would like to express my gratitude to the Colombo Plan Scheme for the scholarship given to me, which made this work possible.

I am very indebted to Mr. E. J. H. Corner, F.R.S., who supervised my work and for his help in preparing the latin diagnoses.

My sincere thanks are also due to the Directors and Keepers of the following Herbaria: Bogor, Cambridge, Edinburgh, Florence, Kew, Leiden, Paris, Sarawak and Singapore, for their cooperation in sending me specimens for study and for providing me with all facilities and help during my visit to their Herbaria.

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\* A more detailed revision of the genus *Quercus* L., occurring in Malesia will be presented in a subsequent paper.

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1. *Q. pseudo-verticillata* E. Soepadmo, spec. nov. Fig. 1.

Arbor 30 m. alta, trunco 90 cm. lato, ad basim alis 2 m. altis praedita; cortice squamoso, profuse exfolianti. Ramuli glabri lenticellati, foliis subverticillatis. Alabastra 2-3 × 2 mm., ovoideoglobosa. Petiolus 5-10 × 3-5 mm., brevissimus tomentosus glabrescens, supra applanatus. Lamina 7-17 × 3-6.5 cm., ellipticolanceolata vel oblanceolata, coriacea, integra, basi cordato vel auriculato, apice obtuso vel acuto, supra glabra, subtus pubescens; costa nervisque lateralibus subtus valde prominentibus, supra applanatis vel praesertim apicem versus subdepressis; nervis lateralibus 8-15, ascendentibus, marginem versus arcuatis; nervis secundariis confertis, subtus vix visibilibus.

Inflorescentiae invisae.

Cupula 2-3.5 cm. alta, 2.5-4 cm. lata, nucis partem dimidiam vel tertiam obtegens, obconico-globosa basi acuto, extus brunneo-sericea glabrescens, intus brunneo-setosa; lamellis 10-12 tenuibus, liberis dentatis praesertim inferioribus. Nux 3-5 × 2-3 cm., cylindrico-subglobosa sericea, apice rotundato vel depresso, umbone conico annulato, basi convexo vel applanato.

Typus: *Chew & Corner RSNB. 4434 (K).*

Tree about 30 m. tall, trunk about 90 cm. in diameter. Buttresses up to 2 m. high. Bark scaly, peeling off profusely. Twig glabrous, lenticellate. Leaves pseudo-verticillate. Buds ovoid-globose, about 2-3 mm. long, and 2 mm. in diameter. Petiole very short, about 0.5-1.0 cm. long and 2 mm. in diameter, tomentose, glabrescent, flattened at its adaxial side. Lamina coriaceous, elliptic-lanceolate or oblanceolate, about 7-17 cm. long, 3-6.5 cm. wide, margin entire, base cordate to auriculate, apex blunt, rounded to acute, upper surface glabrous, lower surface pubescent. Midrib and lateral nerves strongly prominent below, flattened to slightly sunken above, especially at the upper half of the leaf-blade. Lateral nerves about 8-15 pairs, ascendant, arcuating near the margin; secondary nerves faintly visible on the lower surface, close to one another.

Male and female inflorescences and flowers unknown.

Cupule obconical-globose, pointed at its base, covering about  $\frac{1}{3}$ - $\frac{1}{2}$  part of the nut, about 2-3.5 cm. deep, and 2.5-4.0 cm. in diameter; outside brownish sericeous, glabrescent, inside covered all over with brownish stiff hairs; lamellae 10-12, thin, free from one another, dentate at its margin, especially the lower ones. Nut cylindrical-subglobose, sericeous, apex rounded to depressed, with conical, ringed umbo, base convex to flat, about 3-5 cm. long and 2-3 cm. in diameter.

Distribution: so far only known from Mt. Kinabalu, North Borneo.



Fig. 1. *Quercus pseudo-verticillata* E. Soepadmo, spec. nov.: 1, 2 after Chew Wee Lek & Corner RSNB. 4434; 3, 4, 5 after Fuchs & Collette 21665.

Habitat: mountain rain forest, alt. about 1650 m.

Specimens examined: British North Borneo, Mt. Kinabalu, Bembangan River, alt.  $\pm$  1650 m., Febr. fr., *Chew Wee Lek & Corner RSNB. 4434* (K, type); *ibid.*, South Slope of Mt. Kinabalu, Pinosuk Plateau, alt. 1650 m., Sept. fr., *Fuchs & Collenette 21665* (A, CANB, G, K, L, SAR, paratype).

Note: This species may be distinguished from the other species of *Quercus* L. subgen. *Cyclobalanopsis* from Malesia by its pseudo-whorled, short-petioled, coriaceous, elliptic-lanceolate or oblanceolate leaves and by its big cupule and nut.

## 2. *Q. percoriacea* E. Soepadmo, *spec. nov.* Fig. 2.

Arbor trunco 50 cm. lato, ad basim alis ad 1 m. alto praedita; cortice laevi griseo annulato. Ramuli grisei glabri lenticellati. Alabastra 3  $\times$  2 mm., ovoideo-globosa tomentosa. Petiolus 2–3.5  $\times$  0.2–0.3 cm., glaber, ad basim incrassatus, teres, supra subsulcatus. Lamina 10–20  $\times$  5–9 cm., elliptico-ovata, crasse coriacea, subtus sparsim stellato-pubescent, glauca, supra nitida glabra; basi rotundato-acuto, margine incurvato integro undulato, e medio apicem versus distanter crenato; apice acuto vel acuminato 1–1.5 cm. longo obtuso; costa nervisque lateralibus subtus prominentibus, supra depressis vix visibilibus; nervis lateralibus 8–10 ascendentibus, marginem versus arcuatis.

Inflorescentiae invisae.

Infructescentia juvenis 20–30 mm. longa, 3–4 mm. lata, fructus 1–4 immaturos gerens, sericea, glabrescens, lenticellata.

Cupula mature 20 mm. lata, 7–10 mm. alta, nucis partem 1/6 vel 1/5 obtegens, applanata, basi rotundato, dense sericea; lamellis 6–8, inferioribus 4–6 denticulatis, superioribus integris. Nux matura 2 cm. lata et alta, ovoideo-globosa, dense sericea, umbone conico annulato, basi rotundato vel cordato, hilo convexo. Stili in nucibus immaturis 3 recurvi sericei; stigmatum capitato, glabro.

Typus: *Anderson S. 20226* (SAR).

Tree with trunk about 50 cm. in diameter. Buttresses up to 1 m. tall. Bark smooth, grey, hoop-marked. Twig grey, glabrous, lenticellate. Buds ovoid-globose, about 3 mm. long and 2 mm. in diameter, tomentose. Petiole about 2–3.5 cm. long and 0.2–0.3 cm. thick, glabrous, thickened at its base, terete and slightly grooved at its adaxial side. Leaves thick coriaceous, elliptic-ovate, about 10–20 cm. long, 5–9 cm. wide, base rounded-acute, margin incurved, entire and undulate at the lower half, and distantly crenate at the upper half; apex acute to acuminate, tip blunt; acumen about 1–1.5 cm. long; lower surface sparse, stellate pubescent, glaucous, upper surface shiny, glabrous. Midrib and lateral nerves prominent below and sunkened and almost invisible above. Lateral nerves about 8–10 pairs, ascendant, arcuating towards the margin.

Male and female inflorescences and flowers unknown.





Fig. 2. *Quercus percoriacea* E. Soepadmo, spec. nov. After Anderson S. 20226.

Young infructescence about 2–3 cm. long and 0.3–0.4 cm. in diameter, carrying 1–4 young fruits, sericeous, glabrescent, lenticellate. Young cupule obovoid, sericeous, about 0.7–1.0 cm. long and 0.8–1.0 cm. in diameter; base attenuate, lamellae 4–8, the lower ones denticulate, upper ones entire. Young nut ovoid-globose, attenuate towards the conical, ringed umbo; sericeous. Styles 3, recurved, sericeous; stigma glabrous, capitate. Mature cupule flattened, cup-shaped, covering about  $1/6$  or  $1/5$  part of the nut, dense sericeous, base rounded, about 0.7–1.0 cm. deep, and 2.0 cm. in diameter; inside dense sericeous; lamellae free from one another, thin, about 6–8, the 4–6 lower ones denticulate, the rest entire; rim thin. Ripe nut ovoid-globose, dense sericeous, apex rounded, except at the ringed, conical umbo; base rounded to cordate; about  $2 \times 2$  cm; scar convex.

Distribution: only known from the type locality.

Habitat: primary heath forest on terrace sand, at altitude about 1100 m.

Specimens examined: Borneo, Bario, Ulu Baram, path to Pa'Ukat, alt.  $\pm$  1100 m., July fr., *Anderson S. 20226* (A, K, L, SAN, SAR, SING, type).

This new species is characterized by its big (up to 20 cm. long and 9 cm. wide), thick coriaceous leaves and dense sericeous, flattened cup-shaped cupule and ovoid-globose, dense sericeous nut.

3. ***Q. gaharuensis*** E. Soepadmo, *spec. nov.* Fig. 3.

Arbor c. 27 m. alta, trunco c. 30 cm. lato, ad basim breviter alata; cortice laevi, maculato-annulato, lenticellatis sparsis in series longas instructis praedito. Ramuli dense stellato-pilosi, glabrescentes. Alabastra ovoideo-globosa,  $2 \times 2$  mm., dense stellato-tomentosa. Petiolus 2–3.5 cm.  $\times$  2 mm., gracilis, dense stellato-tomentosus, glabrescens, superne applanatus, basim versus incrassatus. Lamina 7–15  $\times$  3–6 cm., elliptico-lanceolata, tenue coriacea, basi attenuato-acuto, margine integro vel subundulato, apicem versus crenato, apice obtuso vel subacuto, supra glabra, subtus dense stellato-pubescentibus et maculis ceraceis glaucis praedita; costa nervisque lateralibus subtus prominentibus, supra vix elevatis; nervulis reticulatis subtus claris; nervis lateralibus utrinsecus 10–15, parallelis dein marginem versus arcuatis.

Inflorescentiae invisae.

Cupula semi-evoluta 1.5–2 cm. alta et lata, ovoideo-globosa, nucem ex integro obtegens, apice rotundato vel truncato, margine tenui, basi attenuato vel truncato, lamellis tenuibus, c. 6–7, inferioribus crenatis recurvatis, aliis integris extus dense sericea, intus pilis rigidis brunneusculis setosa. Nux immatura 1–1.5 cm. longa et lata, ovoidea vel depresso-conica, dense sericea, glabrescens, apice rotundato vel abrupte truncato; stilibus 3 recurvatis, dense stellato-pubescentibus; stigmatibus capitato lato. Hilum nucis convexum.



Fig. 3. *Quercus gaharuensis* E. Soepadmo, spec. nov. After Anderson et alia S. 15534.

Typus: *Anderson et alia S. 15534* (SAR).

Tree about 27 m. tall, trunk about 30 cm. in diameter. Buttresses short, spreading, up to 70 cm. high. Bark smooth, mottled hooped, lenticels scattered and in long rows. Young twig densely covered all over with stellate hairs; older twig glabrous, lenticellate. Buds ovoid-globose, about  $2 \times 2$  mm., dense stellate tomentose. Petiole slender, dense stellate tomentose, glabrescent, thickened at its base, flattened at its adaxial side, about 2–3.5 cm. long, and 2 mm. in diameter. Leaves elliptic-lanceolate, about 7–15 cm. long and 3–6 cm. wide, thin coriaceous, base attenuate-acute, margin entire and slightly undulate at the lower two-third part, and distantly crenate at the upper part; apex rounded to bluntly-acute; upper surface glabrous, lower surface dense, stellate pubescent, below which are glaucous waxy dots. Midrib and lateral nerves prominent below and slightly raised above; reticulation of the secondary nerves distinctly visible at the lower surface. Lateral nerves parallel, ascendant, arcuating towards the margin; about 10–15 pairs.

Male and female inflorescences and flowers unknown.

Half-ripe cupule ovoid-globose, covering the whole nut, apex rounded or truncate, margin thin, base attenuate or truncate, lamellae thin, about 6–7, the lower ones crenate at their margin, recurved, the rest entire, dense sericeous outside and covered all over with brownish, stiff hairs inside; about 1.5–2.0 cm. long and diameter. Young nut ovoid or depressed conical, dense sericeous, glabrescent; apex rounded or abruptly truncate, about 1–1.5 cm. long and diameter; styles 3, recurved, dense stellate pubescent; stigma broad, capitate. Scar of the nut convex.

Distribution: lower slope of Bukit Gaharu, Serian, Sarawak, Borneo.

Habitat: mixed dipterocarp forest, near stream, at altitude about 100 m.

Specimens examined: Borneo, Sarawak, Serian, lower slope of Bukit Gaharu, alt.  $\pm$  100 m., Oct. fr., *Anderson et alia S. 15534* (A, BO, BK, K, L, SAN, SAR, type).

Note: This species was named after the Hill (Bukit) Gaharu, from where the type specimens were collected. Its leaves are rather similar to those of *Q. elmeri* Merr. from Borneo, but it may be distinguished from this species by its bigger sized, stellate pubescent leaves and thin-lamellate cupule, covering the whole nut. A rather similar type of cupule is found in *Q. turbinata* Bl. var. *crassilamellata* Gamble from Malaya, but the later species has the lamellae woody and very thick, and smaller leaves than that of *Q. gaharuensis*.



4. *Q. sumatrana* E. Soepadmo, spec. nov. Fig. 4.

Arbor c. 35 m. alta, trunco c. 130 cm. lata, ad basim alis 1–2.5 m. altis praedita; cortice scabro griseo. Ramuli lenticellati, dense et rigide brunneolo-hirti, glabrescentes. Alabastra c. 2–3 × 1.5–2 mm., ovoideo-globosa, dense pubescens, glabrescentia. Petiolus 1–2.5 cm. × 1–2 mm., gracilis, teres, supra subappplanatus, sparsim et rigide brunneolo-hirtus, ad basim sub-incrassatus. Lamina tenue-chartacea, elliptico-lanceolata, ad basim attenuato-acuta, margine integro undulato vel e medio apicem versus serrulato, apice acuminato 0.5–1.5 cm. longo acuto, subtus sparsim et rigide brunneolo-hirta, glauca, supra glabra; costa nervisque lateralibus subtus prominentibus, supra vix elevatis; nervis lateralibus 8–13, ascendentibus, marginem versus arcuatis.

Inflorescentiae invisae.

Cupula matura applanata, 2–2.5 cm. lata, 0.7–1.0 cm. alta, nucis partem 1/6 vel 1/5 obtegens, ad basim attenuata, dense sericea; lamellis tenuibus, denticulatis, ad marginem liberis. Nux 1.8–3 cm. longa, 1.2–2 cm. lata, ovoideo-conica, ad basim truncata vel cordata, apice acuto, dense sericea; hilum nucis concavum.

Typus: *Achmad 1501* (BO).

Tree up to 35 m. tall, diameter about 130 cm. Buttresses about 1–2.5 m. high. Bark rough, grey. Young twig smooth, covered all over with brownish, stiff hairs; older twig glabrous, lenticellate. Buds ovoid-globose, dense pubescent, glabrescent, about 2–3 mm. long and 1.5–2 mm. in diameter. Petiole slender, terete or slightly flattened at its adaxial side, slightly thickened at its base, sparsely covered with stiff, brownish hairs, about 1–2.5 cm. long and 1–2 mm. thick. Leaves thin-chartaceous, elliptic-lanceolate, base attenuate-acute, margin entire-undulate, or entire near the base and serrulate at the upper part, apex sharp acuminate, acumen about 0.5–1.5 cm. long; lower surface sparsely covered with brownish stiff hairs, dotted all over with glaucous, waxy puncts; upper surface glabrous. Midrib and lateral nerves prominent below and slightly raised at the upper surface; lateral nerves about 8–13 pairs, rarely opposite, ascending and arcuating towards the margin.

Male and female inflorescences and flowers unknown.

Mature cupule flattened cup-shaped, covering about 1/6 or 1/5 part of the nut, base attenuate, dense sericeous on both surfaces, about 0.7–1 cm. deep and 2–2.5 cm. in diameter; lamellae thin, denticulate, free at their margin, about 5–6. Mature nut ovoid-conical, about 1.8–2 cm. long and 1.5–2 cm. in diameter, dense sericeous, base truncate or cordate, scar concave, apex acute.

Distribution: Sumatra.

Habitat: lowland forest.

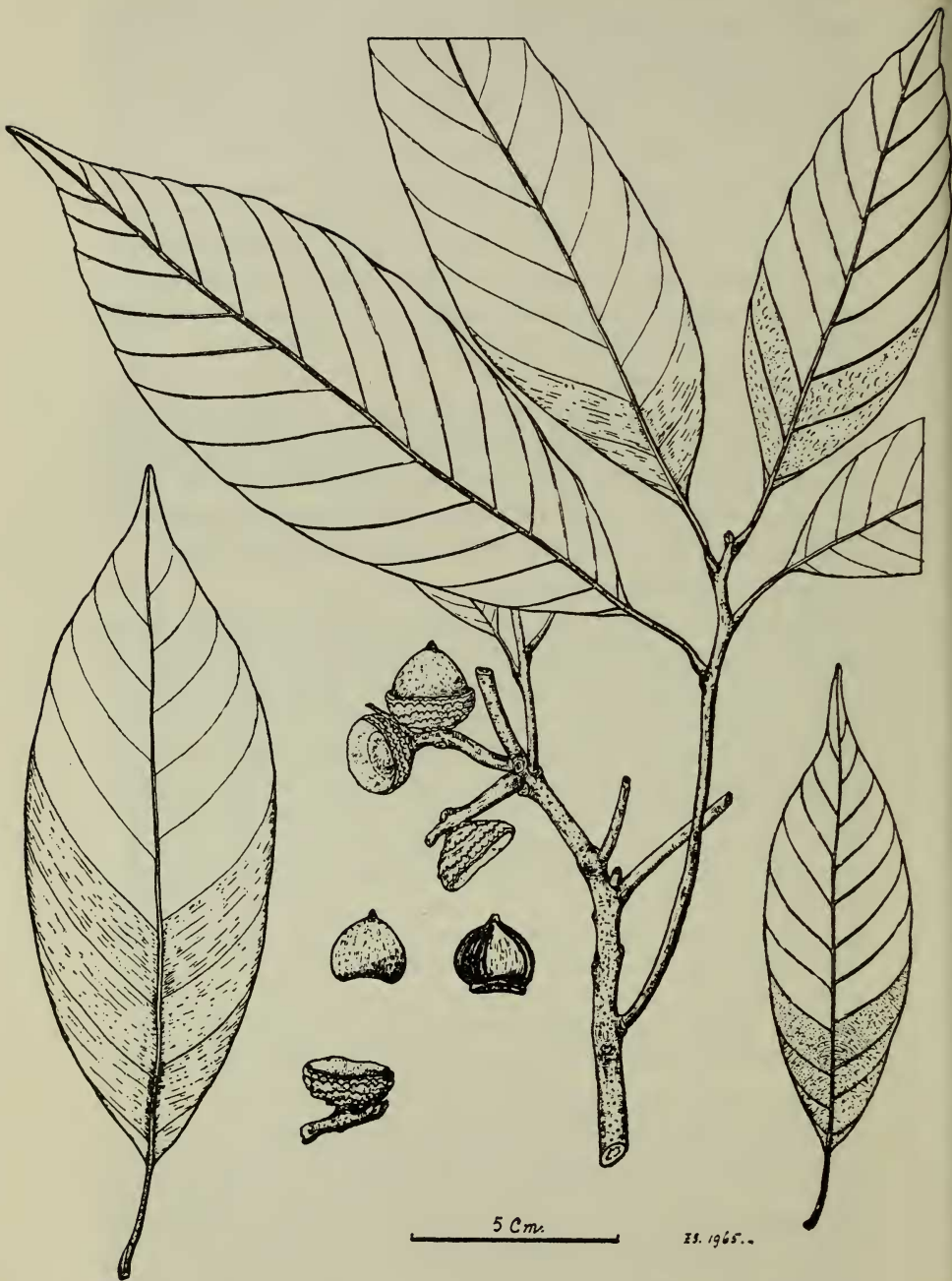


Fig. 4. *Quercus sumatrana* E. Soepadmo, spec. nov. After Achmad 1501.

Specimens examined: NW. Sumatra, Simalur, Tapah, Nov. fr., *Achmad 1501* (BO, L, Type); *ibid.*, May st., *Achmad 1094* (BO, L); *ibid.*, June st., *Achmad 1199* (BO, L).

Note: *Q. sumatrana* may be recognized by its thin-chartaceous, sharp acuminate, glaucous below leaves and flattened cup-shaped, dense sericeous cupule, and by its ovoid-conical, dense sericeous nut with concave scar.

5. *Q. steenisii* E. Soepadmo, spec. nov. Fig. 5.

Arbor 15 m. alta, trunco 60 cm. lato. Ramuli fusci sparsim lenticellati, dense et rigide brunneolo-hirti, glabrescentes. Stipulae 5–10 × 1–2 mm., lineares obtusae dense pubescentes. Petiolus 2–5 × 1–2 mm., brevissimus, ad basim incrassatus, supra applanatus, dense pubescens, glabrescens. Lamina 3–8 × 2–5 cm., elliptico-ovato vel ovato-orbicularis, crasse coriacea, basi rotundato obtuso vel cordatulo, apice rotundato vel subacuto subretuso, margine integro vel undulato, praesertim apicem versus leviter et distanter serrato, paginis ambis primo dense et rigide brunneolo-hirtis glabrescentibus; costa nervisque lateralibus subtus valde elevatis, supra carinatis vel applanatis; nervis lateralibus 6–10, angulo 45°–60° exorientibus, parallelis, marginem versus arcuatis; nervulis reticulatis subtus prominentibus, supra invisibilibus.

Inflorescentia mascula c. 5 cm. longa, gracilis flexuosa axillaris, dense pubescens, cymulis trifloris. Bractaeae 2 × 1 mm., ovatae obtusae, dense pubescentes. Perianthium alte 4–6-lobatum membranaceum, lobis solo ad basim conjunctis, dense pubescens. Stamina 4–6 extrorsa; filamentis 1–1.3 mm. longis, glabris filiformibus; antheris 1 × .5–1 mm., globosa-reniformibus, 4-lobatis, 2-locularis, basifixis, longitudinaliter dehiscentibus; pistillodio ad fasciculam setularum reducto.

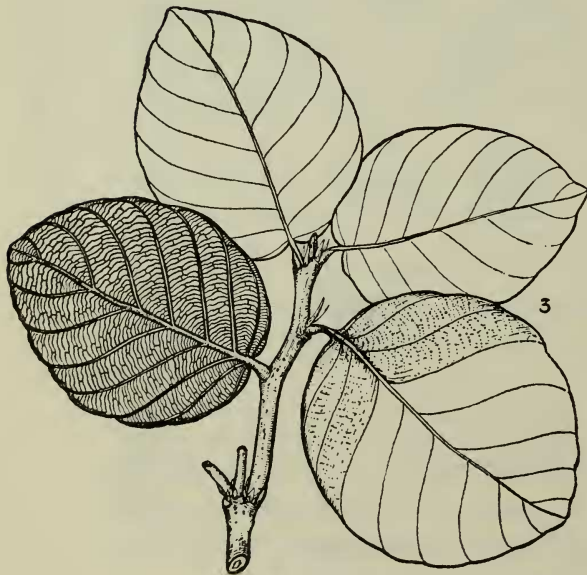
Inflorescentia feminea (modo in statu fructu juvenum visa) 1.5–3 cm. longa, 2–3 mm. crassa, sparsim lenticellata, brunneolo-setulosa, fructus 2–7 gerens. Bractaeae ovato-acutae, crasse coriaceae; bracteolis minoribus caducis. Perianthium 5–6-lobatum, crasse coriaceum, dense pubescens. Staminodia 0–6, plerumque suppressa. Stili 3–4, 1–2 mm. longi, recurvi; stigmatibus lato capitato glabro.

Cupula 12–25 mm. lata, 7–10 mm. alta, patellata vel obconica, nucis partem tertiam vel quartam obtegens; lamellis 7–8, crassis dentatis, summa integra, marginibus recurvis, dense pubescentibus.

Nux 1–2 cm. alta et lata, globosa vel ovoideo-cylindrica, apice rotundata vel depresso, dense sericea glabrescens.

Typus: *van Steenis 8607* (BO, fructu, holotype).

*van Steenis 8379* (BO, inflorescentia mascula, paratype).



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Fig. 5. *Quercus steenisii* E. Soepadmo, spec. nov.: 1, 2, 3 after van Steenis 8607; 4 after van Steenis 8379.



Tree about 15 m. tall, trunk 60 cm. in diameter. Twigs cylindrical, dark in colour, sparsely lenticellate; older twigs glabrous, or sparsely covered with brownish, stiff hairs; young twigs dense brownish, stiff pubescent. Stipule linear with blunt tip, about 0.5–1 cm. long, 1–2 mm. wide, dense pubescent. Petiole very short, about 2–5 mm. long, 1–2 mm. thick, thickened at its base, flattened at its adaxial side, dense pubescent, glabrescent. Leaves elliptic-ovate or ovate-orbicular, thick coriaceous, 3–8 cm. long, 2–5 cm. wide, base rounded, obtuse or slightly cordate, margin entire or undulate or shallowly, distantly serrate, especially near the apex; apex rounded or bluntly acute with slightly emarginate tip; upper surface of the young leaf densely covered with stiff, brownish simple hairs, becoming glabrous or sparsely pubescent, especially on the midrib and lateral nerves; lower leaf surface densely covered with thick layer of brownish, stiff, simple hairs, soon becomes glabrous. Midrib and lateral nerves strongly elevated on the lower leaf surface and keeled or flattened on the upper surface. Lateral nerves about 6–10 pairs, forming 45°–60° with the midrib, parallel, at first straight then arcuating towards the margin; reticulations prominent below, invisible above.

Male inflorescence slender, flexuous, arising from the axil of lower leaf, about 5 cm. long, dense pubescent; cymules 3-flowered. Bract ovate-obtuse, dense pubescent, about 2 mm. long and 1 mm. wide. Male flower with the perianth membranaceous, 4–6-deeply lobed, the lobes join at the base only, dense pubescent. Stamens 4–6, extrorse; filament filiform, glabrous, about 1–1.3 mm. long; anther globular-reniform, basifixed, 2-locular, 4-lobed, longitudinally dehiscent, about 1 × 0.5–1 mm. Rudimentary ovary is reduced to a cluster of stiff hairs. Female inflorescence is not known. Bract ovate-acute, thick coriaceous; bracteoles ovate-acute, smaller than the bract, caducous. Perianth thick coriaceous, 5–6-lobed, dense pubescent; staminodia 0–6, usually suppressed; styles 3–4, about 1–2 mm. long, recurved; stigma broad, capitate, glabrous. Young infructescence about 1.5–3 cm. long, 2–3 mm. thick, sparsely lenticellate and sparsely covered with brownish, stiff, simple hairs; bearing 2–7 young fruits. Young cupule ovoid-globose, dense pubescent; lamellae thick, 3–4, the 2 lower ones dentate, the rest entire. Mature cupule obconical or patelliform, rim thick, enclosing about 1/3 or 1/4 part of the nut; lamellae thick, 7–8, dentate, except the uppermost one, dense pubescent; about 0.7–1.0 cm. deep, and 1.2–2.5 cm. in diameter. Nut globose or ovoid-cylindrical, dense sericeous, glabrescent; apex rounded or depressed; about 1–2 cm. long and 1–2 cm. in diameter.

Distribution: Sumatra.

Habitat: ridge forest, at altitude about 2500–3500 m.

Specimens examined: Sumatra, North Sumatra, Atjeh, Gajolands, Mt. Losir, alt. 3300–3460 m., Febr. fr., v. *Steenis* 8607 (A, BO, K, L, PNH, SING, type); *ibid.*, Putjuk Angasan, alt. 2000 m., Jan. male flower, v. *Steenis* 8379 (A, BO, K, L, PNH, SING, paratype).

Note: This new species may be distinguished from the other known species by its thick, coriaceous, ovate-orbicular, short-petioled leaves with strongly elevated nerves on the lower surface, which is covered all over with very thick layer of brownish, stiff, simple hairs, and by its thick-lamellate dense brownish, stiff-pubescent cupule with recurved, dentate thick rim.